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In vitro gas production parameters of sesame (*Sesamum indicum)* straw treated with sodium hydroxide, urea or sulphuric acid

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Introduction Sesame (*Sesamum indicum)* stover (SS) is the most abundant residue of sesame cultivation in semi-arid regions of Iran, and traditionally used as a basal feed in sheep and goat rations. However, voluntary feed intake and total tract digestibility of this straw are limited by its high complex carbohydrate content and lignin. The feeding value of low quality forages may often be improved with some additives such as urea and sodium hydroxide (Schingoethe *et al*., 1980). The aim of the present study was to evaluate the *in vitro* gas production parameters of sesame stover treated with NaOH, urea or sulphuric acid.

Material and methods Sesame stover was obtained from Iranian plant varieties adapted to grow in semi-arid conditions. The straw was manually chopped (5cm length) and used untreated, or treated with sulphuric acid (SSA, 2ml/100 g DM), urea (SSU, 3g/100g DM), NaOH (SSN, 4g/100g DM) or both NaOH and urea [SSUN, NaOH as 4g/100g DM was sprayed on the straw and kept for 48h, then urea (3g/100g of initial DM) was added). Treated SS was ensiled under anaerobic conditions for 4 weeks. Samples were then taken, and dried and ground (to pass a 2 mm sieve). *In vitro* gas production was determined according to the method of Menke and Steingass (1988). Rumen fluid was collected from three ruminally fistulated sheep (42±2.5kg, body weight) and strained through four layers of cheesecloth. The laboratory handling of rumen fluid was carried out under a continuous flow of CO_2. Into each syringe was weighed 200mg of sample material (4 replicates per treatment sample). The syringe was then filled with 30ml of medium consisting of 10ml rumen fluid and 20ml buffer solution as described by Menke and Steingass (1988). The syringes were placed in an incubator (38.6°C). Gas production was recorded after 2, 4, 8, 12, 16, 24, 36, 48, 72 and 96h of incubation. Statistical analysis was conducted using SAS (1999). The gas production data were fitted using an exponential equation of $P= b(1-e^{-ct})$, where b is the gas production from the quickly and slowly fermentable fraction, c is the fractional gas production rate (/h), t is the incubation time (h) and P is the volume of gas produced at time t.

Results Gas production parameters of the samples are presented in Table 1. The b fraction of gas production parameter was significantly ($p<0.05$) increased when SS was treated with NaOH. However, sulphuric acid caused a decrease in the b fraction compared with untreated sesame straw ($p<0.05$). The c fraction for SSN was lower than SS.

Table 1 Gas production parameters of sesame stover treated with NaOH, urea or sulphuric acid (mean± SE)

	Treatment					
Parameters	SS	SSA	SSU	SSN	SSUN	Significance level
b (ml/200mg DM)	59.4 ± 2.38^{a}	51.0 ± 2.47^{b}	60.7 ± 2.76^{ac}	72.3 ± 2.88^{cd}	61.8 ± 2.47^{ac}	< 0.05
c (/h)	0.04 ± 0.004^{a}	0.05 ± 0.006^{ab}	0.03 ± 0.004^{ac}	0.03 ± 0.003^{bcd}	0.03 ± 0.003^{cd}	< 0.05

Conclusions The results of the current study indicated that both urea and NaOH had a potential to enhance sesame straw digestibility as indicated by the gas production parameters under the conditions of the present study. These results confirmed previous findings where NaOH used as chemical means of improving the digestibility of cereal straw. It was previously indicated that sodium hydroxide might enhance the digestibility when applied to rice straw (Liu *et al*., 2002).

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